WE CLAIM:

1. A variable optical attenuator device comprising:

an input port for launching an input beam of light;

a polarization beam splitter for dividing the input beam into first and second orthogonally polarized sub-beams;

a first lens for collimating the first and second sub-beams, and for redirecting the first and second sub-beams along crisscrossing paths;

a variable polarization rotator disposed in the crisscrossing paths for rotating the polarization of the first and the second sub-beam by a desired amount, whereby each of the first and second sub-beams has first and second orthogonally polarized components;

a second lens for focusing the first and second sub-beams, and for redirecting the first and second sub-beams along substantially parallel paths;

a polarization beam combiner disposed in the parallel paths for combining the first component of the first sub-beam with the second component of the second sub-beam into an output beam; and

an output port for outputting the output beam.

2. The device according to claim 1, wherein the crisscrossing paths intersect proximate the variable polarization rotator, whereby both the first and second sub-beams enter the variable polarization rotator at substantially the same point.

3. The device according to claim 1, wherein the variable polarization rotator is disposed proximate a focal plane of the first lens, whereby the crisscrossing paths intersect proximate the variable polarization rotator.

4. The device according to claim 1, wherein the first and second sub-beams travel through the polarization beam splitter, along the crisscrossing paths, and through the polarization beam combiner in substantially a single plane.

5. The device according to claim 1, further comprising a reflective element between the first lens and the variable polarization rotator or between the polarization rotator and the second lens for redirecting the first and second sub-beams.

6. The device according to claim 5, wherein the reflective element is a retro-reflective element for redirecting the first and second sub-beams back through the second lens and the polarization beam combiner, whereby the output waveguide is substantially adjacent the input waveguide.

7. The device according to claim 5, wherein the first and second lenses comprise a single lens, which redirects the first and second sub-beams twice; and wherein the first and second birefringent elements comprise a single birefringent crystal, which separates and combines the input beam and the output beam, respectively.

8. The device according to claim 1, wherein the polarization beam splitter is sized to receive a plurality of input beams, and divide each of the plurality of input beams into a plurality of first and second sub-beams;

wherein the device further comprises:

a plurality of first lenses for redirecting the plurality of first and second sub-beams along respective crisscrossing paths;

an array of variable polarization rotators for rotating the polarizations of each of the plurality of first and the second sub-beams, respectively, by desired amounts, whereby each of the first and second sub-beams have first and second orthogonally polarized components; and

a plurality of second lenses for redirecting the plurality of first and second sub-beams along substantially parallel paths; and

wherein the polarization beam combiner is sized to receive the plurality of first and second sub-beams for combining respective first components of the first sub-beams with the second components of the second sub-beams.

9. The device according to claim 8, further comprising a reflective element between the first plurality of lenses and the second plurality of lenses for reflecting the first and second sub-beams therebetween.

10. The device according to claim 8, wherein the first and second pluralities of lenses comprise a single array of lenses, which redirects the plurality of first and second sub-beams twice; and wherein the first and second birefringent elements comprise a single birefringent element, which divides and combines the input and output beams, respectively.

11. The device according to claim 1, wherein the polarization beam splitter is a first birefringent crystal; and wherein the polarization beam combiner is a second birefringent crystal.

12. The device according to claim 11, wherein the first and second birefringent crystals induce an optical path length difference between the first and second sub-beams, thereby inducing a predetermined polarization mode dispersion.

13. The device according to claim 1, wherein the variable polarization rotator is a liquid crystal cell.

14. A variable optical attenuator comprising:

a plurality of input ports for launching a plurality of input beams;

a polarization beam splitter for dividing each of the plurality of input beams into first and second sub-beams;

a first array of lenses, each lens for directing one of the first and one of the second sub-beams along crisscrossing paths;

an array of variable polarization rotators, each variable polarization rotator for rotating the polarization of one of the first and one of the second sub-beams, whereby each of the first and second sub-beams has first and second components;

a second array of lenses, each lens for directing one of the first and one of the second sub-beams along substantially parallel paths;

a polarization beam combiner for combining the first components of the first sub-beams with the second components of the second sub-beams, respectively, forming a plurality of output beams; and

a plurality of output ports for outputting the plurality of output beams.

15. The device according to claim 14, wherein each of the crisscrossing paths intersects proximate one of the variable polarization rotators, whereby each of the first and second sub-beams enter respective variable polarization rotators at substantially the same point.

16. The device according to claim 14, wherein the array of variable polarization rotators is disposed in a focal plane of the first array of lenses, whereby the crisscrossing paths intersect proximate thereto.

17. The device according to claim 14, further comprising a reflective element between the first array of lenses and the second array of lenses for reflecting the first and second sub-beams therebetween.

18. The device according to claim 14, wherein the first and second arrays of lenses comprise a single array of lenses, which redirects the plurality of first and second sub-beams twice; and wherein the first and second birefringent elements comprise a single birefringent element, which divides and combines the input and output beams, respectively.

19. The device according to claim 14, wherein the polarization beam splitter is a first birefringent crystal; and wherein the polarization beam combiner is a second birefringent crystal.

20. The device according to claim 14, wherein the variable polarization rotator is a liquid crystal cell.